WE CLAIM:

1. A method of modulating digital signals for transmission over a communications facility, comprising the steps of:

bit loading of a plurality of subchannels;

identifying at least one of the plurality of subchannels that is unloaded;

receiving a payload bitstream;

encoding the received payload bitstream into a plurality of symbols, the symbols each associated with one of the plurality of subchannels, the plurality of symbols arranged as a digital payload signal;

for each of a plurality of phases corresponding to an upsampling function, forming a time-domain sum signal of the payload signal and a trial clip prevention signal, the trial clip prevention signal being orthogonal to the payload signal and associated with the at least one unloaded subchannel, and the trial clip prevention and payload signals having been filtered by a filter associated with the current phase;

applying a function to the sum signal to derive a clipped sum signal;

responsive to the clipped sum signal differing from the sum signal, modifying the trial clip prevention signal for the current phase;

repeating the forming, applying, and modifying steps for each of the plurality of phases;

responsive to the clipped sum signal having differed from the sum signal for each of the plurality of phases, repeating the forming, applying, and modifying steps for the plurality of phases; and

responsive to the clipped sum signal not differing from the sum signal over all of the plurality of phases, processing a sum of the payload signal and the current trial clip prevention signal.

2. The method of claim 1, wherein the forming step comprises:

performing an IDFT on each of the payload and current trial clip prevention signal, each signal modified by a filter response for the current phase; and

adding the IDFT's from the performing step to produce the sum signal.

3. The method of claim 2, further comprising:

deriving an indicator matrix that has non-zero entries along a diagonal at locations corresponding to unloaded subchannels, and zero-valued entries elsewhere;

and wherein the modifying step comprises:

applying an operator, corresponding to the indicator matrix and an inverse of the filter for the current phase, to the clipped sum signal to derive the modified trial clip prevention signal.

4. The method of claim 3, wherein the processing step comprises:

modulating a sum of the payload signal and the current trial clip prevention signal by performing an Inverse Discrete Fourier Transform.

5. The method of claim 4, wherein the processing step comprises:

after the modulating step, formatting the modulated signal into a time domain digital sequence;

upsampling the time domain digital sequence by a factor corresponding to the plurality of phases;

filtering the upsampled digital sequence;

converting the filtered upsampled digital sequence to an analog signal; and

amplifying the analog signal.

6. The method of claim 1, wherein the forming step comprises:

performing an IDFT on the payload signal;

applying a filter response for the current phase to the IDFT of the payload signal;

adding the trial clip prevention signal, in a time domain form and after applying the filter response for the current phase thereto, to the payload signal after the applying step.

7. The method of claim 6, wherein the modifying step comprises:

computing a vector corresponding to the current phase; and

for each of the plurality of phases, modifying the trial clip prevention signal with the clipped sum signal for the current phase.

8. The method of claim 7, wherein the step of modifying the trial clip prevention signal with the clipped sum signal for the current phase comprises:

applying a shaping function to the vector, and adding the result to the trial clip prevention signal filtered by the filter response for the phase.

9. The method of claim 8, wherein the processing step comprises:

upsampling the sum of the payload signal and the clip prevention signal by a factor corresponding to the plurality of phases;

filtering the upsampled sum signal;

converting the filtered upsampled sum signal to an analog signal; and

amplifying the analog signal.

10. A transceiver for transmitting Discrete Multitone (DMT) modulated signals, comprising:

an analog front end function, coupled on one side to a communications facility;

an interface, for interfacing the transceiver to a data source; and

programmable logic circuitry, coupled to the interface and to the analog front end function, for modulating a digital payload bitstream from the data source and

applying the modulated signal to the analog front end function, by executing an instruction routine to perform a sequence of operations comprising:

bit loading a plurality of subchannels;

identifying at least one of the plurality of subchannels that is unloaded;

receiving the payload bitstream;

encoding the received payload bitstream into a plurality of symbols, the symbols each associated with one of the plurality of subchannels, the plurality of symbols arranged as a digital payload signal;

for each of a plurality of phases corresponding to an upsampling function, forming a time-domain sum signal of the payload signal and a trial clip prevention signal, the trial clip prevention signal being orthogonal to the payload signal and associated with the at least one unloaded subchannel, and the trial clip prevention and payload signals having been filtered by a filter associated with the current phase;

applying a function to the sum signal to derive a clipped sum signal;

responsive to the clipped sum signal differing from the sum signal, modifying the trial clip prevention signal for the current phase;

repeating the forming, applying, and modifying steps for each of the plurality of phases;

responsive to the clipped sum signal having differed from the sum signal for each of the plurality of phases, repeating the forming, applying, and modifying steps for the plurality of phases; and

responsive to the clipped sum signal not differing from the sum signal over all of the plurality of phases, processing a sum of the payload signal and the current trial clip prevention signal and forwarding the processed signal to the analog front end function.

11. The transceiver of claim 10, wherein the programmable logic is programmed to perform the forming step by:

performing an IDFT on each of the payload and current trial clip prevention signal, each signal modified by a filter response for the current phase; and

adding the IDFT's from the performing step to produce the sum signal.

12. The transceiver of claim 11, wherein the programmable logic is programmed to perform the step of:

deriving an indicator matrix that has non-zero entries along a diagonal at locations corresponding to unloaded subchannels, and zero-valued entries elsewhere;

and wherein the programmable logic is programmed to perform the modifying step by:

applying an operator, corresponding to the indicator matrix and an inverse of the filter for the current phase, to the clipped sum signal to derive the modified trial clip prevention signal.

13. The transceiver of claim 12, wherein the programmable logic performs the processing step by a sequence of operations comprising:

modulating a sum of the payload signal and the current trial clip prevention signal by performing an Inverse Discrete Fourier Transform;

after the modulating step, formatting the modulated signal into a time domain digital sequence;

upsampling the time domain digital sequence by a factor corresponding to the plurality of phases;

filtering the upsampled digital sequence;

converting the filtered upsampled digital sequence to an analog signal;

amplifying the analog signal; and

applying the amplified analog signal to the analog front end function.

14. The transceiver of claim 10, wherein the programmable logic is programmed to perform the forming step by:

performing an IDFT on the payload signal;

applying a filter response for the current phase to the IDFT of the payload signal;

adding the trial clip prevention signal, in a time domain form and after applying the filter response for the current phase thereto, to the payload signal after the applying step.

15. The transceiver of claim 14, wherein the programmable logic is programmed to perform the modifying step by:

computing a vector corresponding to the current phase; and

for each of the plurality of phases, applying a shaping function to the vector, and adding the result to the trial clip prevention signal filtered by the filter response for the phase.

16. The transceiver of claim 15, wherein the programmable logic is programmed to perform the processing step by:

upsampling the sum of the payload signal and the clip prevention signal by a factor corresponding to the plurality of phases;

filtering the upsampled sum signal;

converting the filtered upsampled sum signal to an analog signal; and

amplifying the analog signal.

17. The transceiver of claim 10, wherein the programmable logic is a digital signal processor.

18. A method of processing a payload signal to avoid clipping, comprising the steps of:

encoding the payload signal into a plurality of symbols, the symbols each associated with one of a plurality of subchannels, the plurality of subchannels including at least one unloaded subchannel for which none of the encoded symbols of the payload signal are associated;

for each of a plurality of phases corresponding to an upsampling function, forming a time-domain sum signal of the payload signal and a trial clip

prevention signal, the trial clip prevention signal being orthogonal to the payload signal and associated with the at least one unloaded subchannel, and the trial clip prevention and payload signals having been filtered by a filter associated with the current phase;

applying a function to the sum signal to derive a clipped sum signal;

responsive to the clipped sum signal differing from the sum signal, modifying the trial clip prevention signal for the current phase;

repeating the forming, applying, and modifying steps for each of the plurality of phases;

responsive to the clipped sum signal having differed from the sum signal for each of the plurality of phases, repeating the forming, applying, and modifying steps for the plurality of phases; and

responsive to the clipped sum signal not differing from the sum signal over all of the plurality of phases, processing a sum of the payload signal and the current trial clip prevention signal.

19. The method of claim 18, wherein the forming step comprises:

performing an inverse orthogonalizing transform on each of the payload and current trial clip prevention signal, each signal modified by a filter response for the current phase; and

adding the transforms from the performing step to produce the sum signal.

20. The method of claim 19, further comprising:

deriving an indicator matrix that has non-zero entries along a diagonal at locations corresponding to unloaded subchannels, and zero-valued entries elsewhere;

and wherein the modifying step comprises:

applying an operator, corresponding to the indicator matrix and an inverse of the filter for the current phase, to the clipped sum signal to derive the modified trial clip prevention signal.

21. The method of claim 20, wherein the orthogonalizing transform is a Fourier transform:

and wherein the processing step comprises:

modulating a sum of the payload signal and the current trial clip prevention signal by performing an Inverse Discrete Fourier Transform.

21. The method of claim 18, wherein the forming step comprises:

performing an inverse orthogonalizing transform on the payload signal;

applying a filter response for the current phase to the transform of the payload signal;

adding the trial clip prevention signal, in a time domain form and after applying the filter response for the current phase thereto, to the payload signal after the applying step.

22. The method of claim 21, wherein the modifying step comprises:

computing a vector corresponding to the current phase; and

for each of the plurality of phases, modifying the trial clip prevention signal with the clipped sum signal for the current phase.

23. The method of claim 22, wherein the step of modifying the trial clip prevention signal with the clipped sum signal for the current phase comprises:

applying a shaping function to the vector, and adding the result to the trial clip prevention signal filtered by the filter response for the phase.

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